Practical challenges regarding in-hospital telemetry monitoring require the development of European Practice Standards

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Introduction

During the last four decades, portable telemetry monitoring has been used for in-hospital detection of arrhythmias in a diverse group of medical and surgical patients. Indeed it is still a cornerstone of care in most critical care settings in order to detect and expedite the treatment of serious cardiac arrhythmias. Telemetry monitoring decreases the need for beds in intensive care units and is also widely used in non-critical care wards. Accordingly, the demand for in-hospital telemetry monitoring has increased beyond capacity in many acute hospital settings, creating patient safety issues. In order to make evidence based decisions regarding the appropriate use of scarce resources, clinicians require guidance. To meet these challenges, the American College of Cardiology published a practice standard for in-hospital cardiac monitoring to help assess which patients are appropriate for admission to noncritical telemetry beds.[1] The guidelines were revised in collaboration with the American Heart Association (AHA) in 2004.[2]

The AHA Practice Standards for Electrocardiographic Monitoring in Hospital Settings[2] classifies patients into three classes; Class I (monitoring is indicated in most, if not all patients), Class II (monitoring may be of benefit in some patients but is not considered essential for all patients) and Class III (monitoring is not indicated). The purpose of the Practice Standard is to promote patient safety and implement effective telemetry monitoring. However, many practice orientated questions persist in clinical practice and there is an urgent need to update the evidence base that informs clinical practice. Five main challenges in terms of in-hospital telemetry monitoring merit further discussion.

Challenge 1: Lack of an empirical underpinning for the current practice

Management of acute and chronic heart disease continues to undergo major changes. In light of technological developments and new evidence, the American statement from 2004 appears less relevant than 10 years ago. Two large studies evaluating how patients are assigned according to the AHA classification of cardiac arrhythmia monitoring have recently been published.[3,4] Both studies challenge the existing description of practice standards, primarily because of the large proportion of non-cardiac patients who are not covered by the AHA recommendations. These patients are mainly classified as Class III patients with no indication for arrhythmia monitoring (look to Challenge 3). Furthermore, the classification of certain entities in Class I and Class II should be reconsidered, as patients with admission diagnoses like heart failure, arrhythmia, chest pain and syncope have the most frequent event rate, yet they all have Class II indication for surveillance.[4,5,6] This is a specific challenge for patient safety which is a major concern within contemporary healthcare.

Challenge 2; Lack of European guidance on the use of telemetry monitoring

A range of European Society of Cardiology (ESC) Clinical Practice Guidelines have been developed in recent years. However, practice standards on telemetry monitoring are lacking, this despite telemetry monitoring being widely used and the incidence of arrhythmia detection is high. Arrhythmias of any kind are revealed in 24 to 33% of patients monitored by telemetry, of which up to 10% are potentially life-threatening events.[4,5,6] Lack of guidance may lead to patients being both under- and overmonitored.[3] This gap is currently filled with local practice standards and operating procedures.[7] This may cause inconsistent and non-evidence based monitoring, that has the potential to compromise patient safety and care outcomes.

Diagnostic tools like resting 12-lead ECG, serial ECGs or Holter monitoring are frequently suggested in ESC guidelines.[8-12] However, continuous monitoring by telemetry to diagnose complex arrhythmias, detect early warning signals of potentially life-threatening events, or as follow-up after invasive treatment or surgery is rarely included. Overall, ESC guidelines do not have clear recommendations for appropriate use of continuous arrhythmia monitoring by in-hospital telemetry. At best, it is noted that telemetry monitoring is useful or warranted.[11,12] It is of concern that neither the level of classification, the suggested response to potential arrhythmias, the links with clinical deterioration nor the recommended timeframe of monitoring is identified. To the best of our knowledge, only Guidelines for management of acute myocardial infarction in patients presenting without persistent ST-segment elevation[13] and Guidelines for the diagnosis and treatment of acute and chronic HF[14] have recommendations for arrhythmia surveillance and time frame of monitoring. These guidelines focus on monitoring patients admitted to coronary care units, where ECG monitoring is recommended for at least 24 hours after symptom onset. Further monitoring depends on stabilization and risk assessment. Corresponding recommendations are warranted as quality assurance in similar patient groups to ease the burden of quick decision making needed in current clinical practice.

Challenge 3: Monitoring non-cardiac patients

In previous research a large number of non-cardiac patients require arrhythmia monitoring in general wards.[4,5] Overall, 15-28% of patients monitored by telemetry have non-cardiac diagnosis.[3,4] As non-cardiac patients are not covered by the AHA statement, most of these patients are classified as Class III patients, with no indication for telemetry monitoring, even though they have high percentage of arrhythmias. In practice, such patients are often admitted to cardiac units for the sole purpose of arrhythmia detection and the length of monitoring in

non-cardiac indication is equal to patients with cardiac diagnosis, but the evidence for this is weak.[4] If European Practice standards are established consideration should be given also to non-cardiac patients.

Challenge 4; Organizational structures and patient safety

Inappropriate telemetry monitoring is common in most clinical settings.[3] Lack of guidance, time and resources as well as high patient volume and workload may result in noncompliance to guidelines and inadequate arrhythmia surveillance – with both over and under monitoring.[3] Although the AHA's Practice Standards implies dedicated monitor watchers as a prerequisite for qualified monitoring and decision making, the responsibility for initiating and discontinuation of telemetry monitoring is still a physician' domain.[2] There is evidence that physicians may continue telemetry monitoring because of concerns about clinical deterioration, rather than concern about serious arrhythmias.[3] Advanced nurse practitioners possess substantial knowledge of cardiac monitoring, and demonstrate high level of guideline adherence in general. Skilled and dedicated monitor watchers are paramount to detect early warning signs that might predict serious adverse arrhythmias events[2], but their availability in clinical practice is variable or even non-existing. Alarms released from central monitor stations must be recognized, interpreted and treated in a timely manner.[2] Also, ensuring correct electrode placement, appropriate electrode attachment and hygiene is pivotal when monitoring patients. Improvements are required in all these areas. Therefore, a practice standard should not be limited to indications for telemetry, but include patient care issues as well. Also recommendations on how telemetry should be organized and integrated within clinical practice are warranted.

Challenge 5: Non-adherence to guidelines

In-hospital telemetry monitoring is widely used.[3] Nevertheless, implementation of AHA' Practice Standards as guidance in clinical practice are rarely documented. Non-adherence to guidelines is a well-known phenomenon, and the barriers to guideline implementation have been fairly extensively documented.[14] Keeping up with recent research and treatment is a primary challenge when recommendations are made for specific diagnoses. Usually guidelines are revised on a regular basis. AHA's Practice Standards were prepared nearly 10 years ago. Major changes in the care and treatment of for example patients with STEMI, NSTEMI or atrial fibrillation have taken place since their introduction.[8.12,13] Regardless of awareness of previous telemetry guidelines, this will influence decision making in telemetry monitoring. Crucial to adherence is assessment of relevance and credibility. Therefore, an up-dated and well promoted practice standard, as well as a strategy for implementation, is warranted. Further research in this area should focus on monitoring telemetry practice in European hospitals to reveal the quality of arrhythmia surveillance and the extent to which existing guidelines are followed.

Conclusion

Current telemetry guidelines are dated, debatable and not necessarily transferable to the European context. This places a serious challenge to patient safety within clinical practice. We call upon ESC bodies, (CCNAP, EHRA and ACCA) to take the challenge and develop new, specific Practice Standards for in-hospital telemetry monitoring.

References

1. Jaffe AS, Atkins JM, Field JM, Francis CK, Gibson RS, Goldberg SJ, Guerci AD, Mentzer RM, Ornato JP, Passamani ER, Shah PK, Smith HC, Weaver WD. Recommended Guidelines for In-Hospital Cardiac Monitoring of Adults for Detection of Arrhythmia. *JACC* 1991;18:1431-1433.
2. Drew BJ, Califf RM, Funk M, Kaufman ES, Krucoff MW, Laks MM, Macfarlane PW, Sommargren C, Swiryn S, Van Hare GF. Practice standards for electrocardiographic

monitoring in hospital settings: an American Heart Association scientific statement from the Councils on Cardiovascular Nursing, Clinical Cardiology, and Cardiovascular Disease in the Young: endorsed by the International Society of Computerized Electrocardiology and the American Association of Critical-Care Nurses. *Circulation* 2004;110:2721-2746.

3. Funk M, Winkler CG, May JL, Stephens K, Fennie KP, Rose LL, Turkman YE, Drew BJ. Unnecessary arrhythmia monitoring and underutilization of ischemia and QT interval monitoring in current clinical practice: baseline results of the Practical Use of the Latest Standards for Electrocardiography trial. *J Electrocardiol* 2010;43:542-547.
4. Fålun N, Nordrehaug JE, Hoff PI, Langørgen J, Moons P, Norekvål TM. Evalutation of the Appropriateness and Outcome of In-Hospital Telemetry Monitoring. *Am J Cardiol.* 2013 Oct 15; 112 (8):1219-23.
5. Estrada CA, Rosman HS, Prasad NK, Battilana G, Alexander M, Held AC, Young MJ. Evaluation of guidelines for the use of telemetry in the non-intensive-care setting. *J Gen Intern Med* 2000;15:51-55.
6. Zorzi A, Peruzza F, Stella F, Del Monte A, Corrado D et al. Life-threatening ventricular tachyarrhythmias in the cardiology department: Implications for appropriate prescription of telemetry monitoring. *Resuscitation*. 2016 Apr;101:6-11.
7. Dressler R, Dryer MM, Coletti C, Mahoney D, Doorey AJ. Altering overuse of cardiac telemetry in non-intensive care unit settings by hardwiring the use of American Heart Association guidelines. *JAMA Intern Med*. 2014 Nov;174 (11):1852-4.
8. Camm AJ, Lip G, Caterina RD, Savelieva I, Atar D, Hohnloser S, Hindricks G et al. 2012 focused update of the ESC Guidelines for the management of atrial fibrillation. An update of the 2010 ESC Guidelines for the management of atrial fibrillation. *Eur Heart J*. 2012; 33, 2719–2747.
9. Blomström-Lundqvist C, Scheinman MM, Aliot EM, Alpert JS et al. ACC/AHA/ESC guidelines for the management of patients with supraventricular arrhythmias--executive summary. *J Am Coll Cardiol.* 2003 Oct 15; 42(8):1493-531.
10. Moya A, Sutton R, Ammirati F, Blanc JJ et al. Guidelines for the diagnosis and management of syncope (version 2009). The Task Force for the Diagnosis and Management of Syncope of the European Society of Cardiology (ESC). *Eur Heart J*. 2009; 30, 2631–2671.
11. Brignole M, Auricchio A, Baron-Esquivias G, Bordachar P et al. 2013 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy. TheTask Force on cardiac pacing and resynchronization therapy of the European Society of Cardiology (ESC). *Eur Heart J* 2013: 34, 2281–2329.
12. Steg PG, James SK, Atar D, Badano LP, Blömstrom-Lundqvist C et al. Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. The Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC). *Eur Heart J*. 2012; 33, 2569–2619.
13. Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H et al. ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *Eur Heart J*. 2011; 32(23):2999-3054.
14. McMurray et al, 2012. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012. The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. *Eur J Heart Fail.* 2012; 14, 803–869.
15. Thompson DR. Clinical guidelines: Some considerations. Editorial. *Eur J Cardiovasc Nurs* 2008; 7:91-93.